

REMARKS

At the outset, the Examiner is thanked for the thorough review and consideration of the present application.

The Examiner's non-final Office Action dated November 9, 2000 has been received and its contents reviewed. Claims 5-29 were pending in the present application. Claims 1-4 have been withdrawn in the Supplemental Amendment, filed August 10, 2000, as a result of a restriction requirement. By this amendment, claims 15, 17, 20, 22, 25 and 28 have been amended, claims 5-14, 27 and 29 have been canceled, and claims 30-87 have been added. Accordingly, claims 15-26, 28, 30-87 are currently pending, of which 15, 17, 20, 22, 25, 28, 30, 31, 32, 33, 34, 35 are independent.

Referring now to the Office Action, claims 5, 7, 10, 12, 15, 17, 20, 22, 25, and 27-29 are objected under 37 CFR 1.75 for containing informalities. With respect to claims 5, 7, 10, 12, 27, and 29, Applicants have canceled the claims. Accordingly, their objection is now moot. With respect to claims 15, 17, 20, 22, 25, and 28, Applicants have amended these claims as recommended by the Examiner to over the objection. Accordingly, the objection is respectfully requested to be reconsidered and withdrawn.

With respect to claims 15, 16, 17, 18, 19, 20, 21, 22, 23 and 24, the Examiner indicated that these claims would be objected to as being substantially duplicate of claims 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14, respectively, should the later be found allowable. Applicants have canceled claims 5-14. Therefore, this objection is now moot.

Claims 5-29 stand rejected under the judicially created doctrine of obviousness-type double patenting as allegedly unpatentable over claim 1 of Zhang et al. (U.S. Patent No. 6,077,758) in view of Zhang et al. (U.S. Patent No. 5,529,937). This rejection is respectfully traversed.

Applicants respectfully submit that U.S. Patents Nos. 6,077,758 and 5,529,937 teach promoting crystallization of the silicon active layer, and forming a silicon oxide film on the silicon active layer by irradiating an intense light to the silicon active layer in an atmosphere

containing hydrogen chloride diluted by oxygen, followed by etching the silicon oxide film to reduce the density of nickel in the silicon active layer.

Further, the Zhang et al. references do not teach, suggest, or imply flattening a surface of a semiconductor film. Hence, the rejection of claims 15-26 and 28 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of Zhang et al. (U.S. Patent No. 6,077,758) in view of Zhang et al. (U.S. Patent No. 5,529,937) is insupportable, as the cited references are both deficient.

Further, as described in the specification, Applicants respectfully submit that the present invention has a step for flattening a surface of a semiconductor film. In case of a top gate type TFT, an asperities (ridges) produced on the surface of the semiconductor film greatly affects characteristics of the TFT. For this reason, it is effective to flatten the surface of the semiconductor film. Claims 15, 17, 20, 22, 25 and 28 amended to include the language "to flatten a surface of the crystalline semiconductor thin film" to further distinguish the claimed invention.


In view of the arguments and amendments above, Applicants respectfully request reconsideration and withdrawal of the judicially created doctrine of obviousness-type double patenting rejection of claims 5-29.

New claims 30-87 have been added to complete the scope of the invention in which Applicants are entitled.

CONCLUSION

Having responded to all rejections and objections set forth in the outstanding non-final Office Action, it is submitted that claims 15-26, 28, and new claims 30-87 are now in condition for allowance. An early and favorable Notice of Allowance is respectfully solicited. In the event that the Examiner is of the opinion that a brief telephone or personal interview will facilitate allowance of one or more of the above claims, the Examiner is courteously requested to contact Applicants' undersigned representative.

Respectfully submitted,

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**VERSION OF AMENDED CLAIMS WITH
MARKINGS TO SHOW CHANGES MADE**

15. (Amended) A method of fabricating a semiconductor device including a thin film transistor, wherein the thin film transistor is formed through the steps of:

adding a catalytic element for facilitating crystallization of an amorphous semiconductor thin film to [a part or an entire region] at least a portion of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the [part or the entire region] at least a portion of the amorphous semiconductor thin film into a crystalline semiconductor thin film; [and]

carrying out a second heat treatment for the crystalline semiconductor thin film at 900 to 1200°C in a reducing atmosphere to flatten a surface of the crystalline semiconductor thin film.

17. (Amended) A method of fabricating a semiconductor device including a thin film transistor, wherein the thin film transistor is formed through the steps of:

adding a catalytic element for facilitating crystallization of an amorphous semiconductor thin film to [a part or an entire region] at least a portion of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the [part or the entire region] at least a portion of the amorphous semiconductor thin film into a crystalline semiconductor thin film; and

carrying out a second heat treatment for the crystalline semiconductor thin film in a reducing atmosphere including a halogen element to flatten a surface of the crystalline semiconductor thin film.

20. (Amended) A method of fabricating a semiconductor device including a thin film transistor, wherein the thin film transistor is formed through the steps of:

adding a catalytic element for facilitating crystallization of an amorphous semiconductor thin film to [a part or an entire region] at least a portion of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the [part or the entire region] at least a portion of the amorphous semiconductor thin film into a crystalline semiconductor thin film;

carrying out a second heat treatment of irradiating the crystalline semiconductor thin film with ultraviolet light or infrared light; and

carrying out a third heat treatment for the crystalline semiconductor thin film at 900 to 1200°C in a reducing atmosphere to flatten a surface of the crystalline semiconductor thin film.

22. (Amended) A method of fabricating a semiconductor device including a thin film transistor, wherein the thin film transistor is formed through the steps of:

adding a catalytic element for facilitating crystallization of an amorphous semiconductor thin film to [a part or an entire region] at least a portion of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the [part or the entire region] at least a portion of the amorphous semiconductor thin film into a crystalline semiconductor thin film;

carrying out a second heat treatment of irradiating the crystalline semiconductor thin film with ultraviolet light or infrared light; and

carrying out a third heat treatment for the crystalline semiconductor thin film in a reducing atmosphere including a halogen element to flatten a surface of the crystalline semiconductor thin film.

25. (Amended) A method of fabricating a semiconductor device including a thin film transistor, wherein the thin film transistor is formed through the steps of:

adding a catalytic element for facilitating crystallization of an amorphous semiconductor thin film to [a part or an entire region] at least a portion of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the [part or the entire region] at least a portion of the amorphous semiconductor thin film into a crystalline semiconductor thin film;

selectively providing the crystalline semiconductor thin film with an element of group 15;

carrying out a second heat treatment to getter the catalytic element into a region of the crystalline semiconductor thin film selectively provided with the element of group 15;

patterning the crystalline semiconductor thin film into at least one crystalline semiconductor island to become at least a channel formation region by removing at least the region of the crystalline semiconductor thin film selectively provided with the element of group 15; and

carrying out a third heat treatment for the at least one crystalline semiconductor island at 900 to 1200°C in a reducing atmosphere to flatten a surface of the at least one crystalline semiconductor island.

28. (Amended) A method of fabricating a crystalline semiconductor thin film, comprising the steps of:

adding a catalytic element for facilitating crystallization of an amorphous semiconductor thin film to [a part or an entire region] at least a portion of the amorphous semiconductor thin film;

carrying out a first heat treatment to transform the [part or the entire region] at least a portion of the amorphous semiconductor thin film into a crystalline semiconductor thin film; and

carrying out a second heat treatment for the crystalline semiconductor thin film at 900 to 1200°C in an atmosphere containing hydrogen therein to flatten a surface of the crystalline semiconductor thin film.